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Trauma Care

A Proposed System for California

IT HAS BEEN previously shown that care of critically injured patients in California is less than optimal.[1] In this study outcomes of trauma patients in Orange County and San Francisco were compared and a significantly poorer outcome was observed in Orange County. It was concluded that the major difference in patient outcome between San Francisco and Orange County was the rapid and effective provision of definitive care in San Francisco where a trauma center was designated and a trauma care system was in operation.

Under the stimulus and direction of the National EMS (Emergency Medical Service) program, trauma centers are being designated across the country. This designation process plus the efforts of the American College of Surgeons[2-4] to improve trauma care should result in a better trauma system.

Little has been done in California, however, to correct the situation in regions other than Orange County and the inland counties. The purpose of this paper is to propose a statewide trauma care system for the management of severely injured patients and ways to effect its implementation.

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Background and Rationale

Trauma remains a major health and social problem. It is still the number one cause of death in people up to the age of 38. The death rate due to trauma between ages 15 and 24 has increased from 106 per 100,000 to 120 per 100,000 between 1960 and 1978: an increase of 13 percent. During the same period the death rate for ages 25 to 64 declined 16 percent. Murders have increased from 8,464 annually in 1960 to 21,080 in 1978. The overall death rate for American teens and young adults is 50 percent higher than counterparts in Britain, Sweden and Japan. Trauma affects young, productive citizens and the estimated cost for death, disability and loss of productivity exceeds 75 million dollars a *day*. The most tragic statistic is that at least half of the deaths are needless and preventable, if better treatment, educational and research programs were linked in an operational system. Optimal trauma treatment programs include preplanned operation of an Emergency Medical Service System which includes carefully defined injury levels of patients related to hospital and prehospital response capabilities.

The purpose of categorization as part of a regionalized plan is twofold: to improve the quality of care and to decrease its cost. In 1976 the American College of Surgeons' Committee on Trauma presented optimal guidelines for the care of trauma patients.[2] These have subsequently been updated[3] and additional guidelines presented.[4] The intent of the guidelines is to fulfill the three R's: get the *right* patient to the *right* hospital at the *right* time. The original guidelines addressed categorization and qualifications of the facility without categorizing patients or defining the qualifications of the surgeons and personnel attending the trauma patient. These have been included in the recent addendum to the guidelines.

The most recent guidelines categorize facilities into three levels of care. All levels must demonstrate *commitment* to the performance of specialized trauma care, which means that not every hospital is or should be identified for operation of the system no matter what physical or personnel resources are present. The differences between level I and II facilities are minimal. Both should have an inhouse general surgeon and anesthesiologist to care for trauma patients. A level I facility should also have an inhouse neurosurgeon. The major difference of a level I facility is an obligation to train physicians and paraprofessionals in trauma care and to engage in trauma research. A level II facility is not primarily a teaching hospital. In order to maintain proficiency according to the guidelines, a level I facility should treat approximately 1,000 category I or II patients per year. The level II facility should treat approximately 350 to 450 category I or II patients annually. These guidelines address cost containment as well as quality of care.

Guidelines for categorization of patients by field personnel have also been developed. This is a further attempt to triage patients appropriately, recognizing that most trauma victims (category III) do not require treatment in level I or II facilities. A summary of the proposed patient categorization guidelines is presented in Table 1.

Getting the *right* patient to the *right* hospital at

TABLE 1.—*Field Categorization of Trauma Patients*

Systems	*Category I*	*Category II*	*Category III*
Soft tissue	Avulsion-type injuries, severe uncontrolled bleeding	Soft tissue injuries with stabilized bleeding	Soft tissue injuries of moderate degree
Fractures	Open fractures, pelvic fractures, severe maxillo-facial injuries	Single open or closed fractures	Uncomplicated fractures
Abdomen	Blunt or penetrating abdominal injuries especially when associated with hypotension	Blunt abdominal or penetrating trauma not producing hypotension	No abdominal injuries
Chest	Unstable chest injuries, respiratory rate >30 or <10	Multiple rib fractures without flailed segments, respiratory rate >20 or <10	No respiratory distress, respiratory rate 10 to 20
Neurological ...	Prolonged loss of consciousness, posturing, lateralizing signs, open cranial injuries, paralysis	Transient loss of consciousness, oriented to time, place and person	No neurological injuries
Vital signs	Blood pressure <90 systolic; pulse>100 or <60; skin cool, ashen, pale	Blood pressure >90 systolic; pulse 60-100; skin warm to slightly cool	Blood pressure >100 systolic; pulse 60-100; skin dry, warm

the *right* time implies rapid, prompt transportation with adequately trained field personnel to care for victims. Until recently, California has not had organized rotary wing transportation to any of its facilities. Fixed wing aircraft have been available for some time on a sporadic basis. Rotary wing aircraft have repeatedly proved their value in the transport of the seriously injured patient, both in Vietnam and in civilian situations in this country.[5,6] California has not been a leader in the expansion of this technology.

Conservatively, there are at least 240,000 injury producing accidents in California annually. It is not known how many of the injured victims are admitted to hospitals. Based on California Highway Patrol accident reports approximately 8 percent of these injuries correspond to the category I or II injury severity developed by the American College of Surgeons. It is these patients who should be triaged to level I and II designated trauma centers. The rest (92 percent) fall into category III. Almost all of these latter patients can be evaluated and treated in level III hospital emergency rooms and an estimated 25 percent to 40 percent would subsequently be admitted to that hospital.

TABLE 2.—*California Level I Facilities*

San Francisco
Sacramento†
Loma Linda†
San Diego†
Los Angeles—2
Orange*
San Jose

*Already designated, triage protocols operational.
†Already designated, triage protocols to be developed.

TABLE 3.—*California Level II Facilities Suggested Geographic Locations*

Area	*Emergency Medical Service Region*
Napa	A
Oakland	A
Redding	B
Stockton	B
Modesto	B
Fresno	B
Palm Springs	C
San Bernardino*—2	C
San Diego—3	D
Ventura	E
Los Angeles—4	F
Orange*—3	G
Salinas-Monterey	H

*Already designated.

Proposed Trauma System Standards

Data analysis by staff of the California State Department of Health Services shows that approximately 19,000 auto accident victims fell into patient categories I and II in 1978. Based on population density, geography and current resource organization, the state can be divided into eight EMS/trauma regions, each served by a level I facility and several level II facilities. Based on population density and the estimated number of category I and II cases, 15 to 18 level II facilities should be identified to care for critical patients. The proposed geographic locations of level I and II facilities are given in Tables 2 and 3 and shown pictorially in Figure 1.

The level I institution is the tertiary care facility and should provide care for approximately 1,000 severely injured patients per year in order to develop and maintain competency to provide care, training and research for the entire region. The level I facility is committed to outreach efforts not only with level II centers but with every hospital in its region to improve all aspects of patient trauma care. The level II center is committed to provide care for at least 350 critically injured (category I and II) trauma patients per year. The level III facility will most often be an

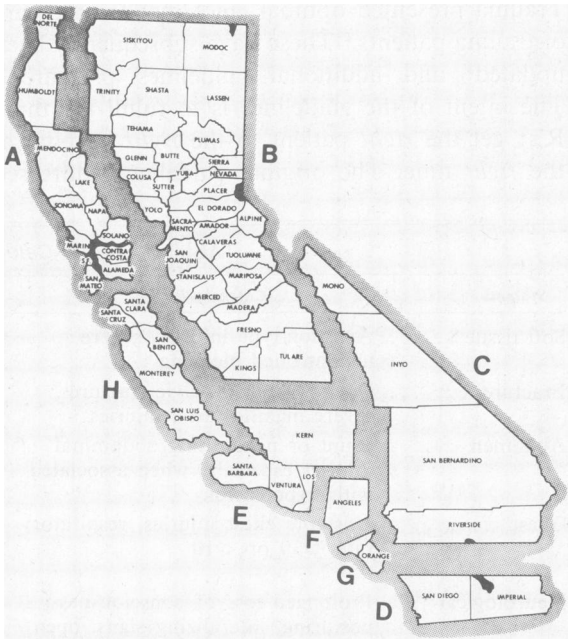

Figure 1.—Proposed geographic location of level I and II facilities. Letters refer to eight EMS/trauma regions, which are based on population density, geography and current resource organization.

institution of 100 to 250 beds in a community or region that lacks hospitals of level I or II capability.

Trauma standards include defined prehospital care organization. All the well-identified EMS components of transportation, communication, training, and the like, are specially identified, organized and directed to trauma patients. As an example, a patient with injuries of category I severity must be identified by prehospital personnel and, under medical direction, given appropriate field care and triaged to a level I or II trauma center in order to make the operational system effective. These prehospital components are part of the trauma standard and are the responsibility of the regional EMS/trauma system to specify and refine.

The trauma system standards are fundamentally a matter of sound and accountable patient care, that is a professional prerogative. The patient treatment is basically a surgical responsibility. Therefore, the standards for trauma care are the professional obligation of the surgical community particularly those surgeons who intend to commit themselves to trauma care competency. The standards, therefore, should be developed on a regional and, if necessary, subregional basis by the entire medical community under surgical service leadership. Government also has a role in this standard: cooperatively making legal and funding resources available and accessible to the system operation and in the implementation of the trauma system.

Discussion

Benefits from such a proposed system are obvious. Most important is improved patient outcome, both immediate (reduction of mortality) and long-term (reduction in permanent disability). An additional benefit is cost-effectiveness. The public cannot afford to pay for unnecessary trauma centers. We feel this is a rational and logical approach to trauma treatment in California. Another benefit is the ability to gather data to more accurately forecast needs as well as provide training in trauma care to physicians, nurses and paramedics.

It has long been recognized that economics are the primary impediment to system design. Physicians and hospital administrators are reluctant to institute new systems which could interrupt or change patient referral patterns. We think the system proposed allays these fears. Less than 10 percent of all accident victims would be directed to level I or II facilities for treatment. The remaining 90 percent or more would be treated at community hospitals designated as level III facilities. Care of category I patients is disruptive to an unprepared community hospital. Early identification and transport of critical patients to level I or II facilities by preplanning and operational integrity benefits both patients and hospitals.

It is conceivable that the number of level II facilities proposed has been underestimated. Farm, industrial and home accidents, as well as urban crime injuries, have not been included in determining need. It is possible that additional level II facilities are needed in the San Fernando Valley, Humboldt and San Joaquin Valley regions. Although not specifically stated, it is recognized that other states might also contribute significantly to providing care to the accident or trauma victims of California. For example, trauma victims in the Tahoe Basin are best treated by transport to a level I or II facility in Reno, Nevada. Similarly, trauma victims in the northeast part of the state are best transported to a level II facility in Medford, Oregon.

A serious deficiency exists in this state in regard to air transport of critically injured patients. Private firms have just recently begun using rotary wing aircraft for this purpose in California. This is a great concern since it represents another example of equipment used in the hospital *strategic arms* race. Helicopter transport services are defined under certificate of need to insure cost-effectiveness. Maintenance of skills of the people involved and rational system operation also argue for this control. Ideally, a nonprofit corporation, funded by both private and public sectors, should establish a rotary wing net to blanket the entire state. With minimal investment and subsidized support, such a system could be based at some of the level I and II facilities mentioned in this proposal. Training of personnel and continuing maintenance of skills could be provided at these facilities. This system could also be used for the transport of high-risk neonates, obstetrical and other critically ill (nontrauma) patients.

Implementation

Within six months of publication of this proposal, this committee, and its Southern California counterparts will contact existing EMS lead agencies in the trauma regions identified in this pro-

posal. Local trauma committees will recommend system design, regional standards and designation of the level I, II and III facilities. If political impediments are encountered, outside *consultation* might be helpful but designation remains a local process—a joint venture of the local trauma committee and the EMS lead agency.

Following designation as a level I, II or III facility a site visit by a peer review team would be carried out within 12 months. Selection of the peer review team would be by the American College of Surgeons Committee on Trauma. Following successful peer review official designation would be made by the state EMS Agency and various pertinent health agencies notified.

Such a program as is described here is long overdue in California. It is time to join the 20th century and provide a system that is designed for the benefit of patients not physicians and hospitals.

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